

WHAT IS CLAIMED IS:

1. A method for manufacturing a multilayer ceramic substrate,
comprising:

providing a green laminate having a plurality of laminated green base
layers containing a low-temperature-sinterable ceramic material, a green constraining
5 layer disposed to contact a principal surface of at least one layer of said green base
layers and containing an inorganic material which does not sinter at the sintering
temperature of said low-temperature-sinterable ceramic material, and at least one
wiring conductor disposed in association with said green base layers; and

firing said green laminate at a temperature at which said low-
10 temperature-sinterable ceramic material sinters,

wherein said low-temperature-sinterable ceramic material and said
inorganic material chemically react with each other during said firing step to form a
reaction layer along an interface between said green base layer and said green
constraining layer.

2. The method for manufacturing a multilayer ceramic substrate
according to Claim 1, wherein said low-temperature-sinterable ceramic material and
said inorganic material chemically react with each other during said firing step to
form a crystal phase from a component contained in said low-temperature-sinterable
5 ceramic material and a component contained in said inorganic material.

3. The method for manufacturing a multilayer ceramic substrate
according to Claim 2, wherein said low-temperature-sinterable ceramic material
comprises borosilicate glass, and said inorganic material is at least one compound
selected from the group consisting of spinel, mullite, magnesia, zirconia, zinc oxide,

5 nickel oxide, lanthanum oxide, cobalt oxide, chromium oxide, titanium oxide, iron oxide, calcium oxide, silicon oxide, silicon carbide, boron carbide, tungsten carbide, silicon nitride and boron nitride.

4. The method for manufacturing a multilayer ceramic substrate according to Claim 2, wherein said low-temperature-sinterable ceramic material comprises alumina, and said inorganic material comprises magnesia or cobalt oxide.

5 5. The method for manufacturing a multilayer ceramic substrate according to Claim 1, wherein said low-temperature-sinterable ceramic material and said inorganic material chemically react with each other during said firing step such that a component contained in one of said low-temperature-sinterable ceramic material and said inorganic material diffuses, dissolves or forms a solid solution in a glassy or amorphous phase or a crystal phase included in the other of said low-temperature-sinterable ceramic material and said inorganic material.

6. The method for manufacturing a multilayer ceramic substrate according to Claim 5, wherein said low-temperature-sinterable ceramic material comprises borosilicate glass, and said inorganic material comprises alumina powder has a particle size of about 100 nm or less.

7. The method for manufacturing a multilayer ceramic substrate according to Claim 1, wherein the temperature is raised at about 15°C/min. or less during said firing.

8. The method for manufacturing a multilayer ceramic substrate according to Claim 7, wherein the maximum temperature achieved during said firing is maintained for at least about 10 minutes.

9. The method for manufacturing a multilayer ceramic substrate according to Claim 8, wherein the maximum temperature achieved during said firing is maintained for about 30 to 60 minutes.

10. The method for manufacturing a multilayer ceramic substrate according to Claim 10, further comprising forming said green laminate.

11. The method for manufacturing a multilayer ceramic substrate according to Claim 1, wherein the maximum temperature achieved during said firing is maintained for at least about 10 minutes.

12. The method for manufacturing a multilayer ceramic substrate according to Claim 11, wherein the maximum temperature achieved during said firing is maintained for about 30 to 60 minutes.

13. The method for manufacturing a multilayer ceramic substrate according to Claim 1, wherein said laminate has a green constraining layer at each end in the laminating direction of said laminate, and

said method further comprises removing, after said firing step, at least part of said reaction layer and said green constraining layer at each end in the laminating direction of said laminate.

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14. The method for manufacturing a multilayer ceramic substrate according to Claim 13, further comprising mounting at least one electronic component on an outer surface of the laminate after said firing.

15. The method for manufacturing a multilayer ceramic substrate according to Claim 14, further comprising forming said green laminate.

16. The method for manufacturing a multilayer ceramic substrate according to Claim 1, further comprising forming said green laminate.

17. A multilayer ceramic substrate produced by the method for manufacturing a multilayer ceramic substrate according to Claim 1.

18. An electronic device including the multilayer ceramic substrate according to Claim 17 and a motherboard for mounting said multilayer ceramic substrate.

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